AMENDMENTS TO THE CLAIMS

1. (Currently amended) A microfluidic device, comprising:

a source fluid flow channel;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane comprises a porous-silicon membrane; and

a field-force/gradient mechanism proximate the porous membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous membrane located in the cross-channel area,

wherein the porous membrane <u>comprises a material which is capable of exhibiting a change in both an optical and an electrical characteristic and wherein the porous membrane</u> is a sensor exhibiting sensing characteristics causing a change in at least one of an optical and electrical characteristic in response to exposure to a targeted fluid or reaction.

2-9. (Cancelled)

10. (Original) The device of claim 1, further comprising a light source and a detector, the light source and the detector being focused at the cross-channel area.

11. (Original) The device of claim 1, wherein the thickness of the porous membrane is between 0.01 and 50 micrometers.

12. (Original) The device of claim 1, wherein the porous membrane is capable of fractionating molecules based on size, molecular weight, charges, chemical affinity or other chemical/physical properties.

13. (Original) The device of claim 1, wherein the porous membrane is made of a single crystal porous silicon (PSi).

14. (Original) The device of claim 1, wherein the porous membrane is made of a porous polysilicon (PPSi).

15. (Original) The device of claim 1, further comprising a substrate, the source fluid flow channel and the target fluid flow channel being formed in the substrate.

16. (Original) The device of claim 15, wherein the substrate is made of polydimethyl siloxane (PDMS).

17. (Original) The device of claim 15, wherein the substrate is made of silicon.

18. (Original) The device of claim 15, wherein the porous membrane is integral with the substrate.

19. (Original) The device of claim 1, wherein the device is a disposable device.

20. (Original) The device of claim 1, wherein the device is a reusable device.

21. (Original) The device of claim 1, wherein the source fluid flow channel and the target fluid flow channel intersect at a 90 degree angle at the cross-channel area.

22. (Currently amended) A microfluidic molecular-flow fractionator device, comprising:

a substrate, the substrate including:

one or more source fluid flow channels;

one or more target fluid flow channels in fluid communication with the one or more source fluid flow channels; and

one or more cross-channel areas at the intersection of each source fluid flow channel and each target fluid flow channel, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane positioned in each cross-channel area separating the source fluid flow channels from the target fluid flow channels, wherein the porous membrane comprises a porous silicon membrane; and

a field-force/gradient mechanism proximate the porous membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous membrane located in the cross-channel area,

wherein the porous membrane <u>comprises a material which is capable of exhibiting a change in both an optical and an electrical characteristic and wherein the porous membrane</u> is a sensor exhibiting sensing characteristics causing a change in at least one of an optical and electrical characteristic in response to exposure to a targeted fluid or reaction.

23-30. (Canceled)

31. (Original) The device of claim 22, further comprising a light source and a detector, the light source and the detector being focused at the cross-channel area.

32. (Original) The device of claim 22, wherein the thickness of the one or more porous membranes are between 0.01 and 50 micrometers.

33. (Original) The device of claim 22, wherein the one or more porous membranes are capable of fractionating molecules based on size, molecular weight, charges, chemical affinity, or other chemical/physical properties.

34. (Original) The device of claim 22, wherein the one or more porous membranes are made of a single crystal porous silicon (PSi).

35. (Original) The device of claim 22, wherein the one or more porous membranes are made of a porous polysilicon (PPSi).

36. (Original) The device of claim 22, wherein the substrate is made of silicon.

37. (Original) The device of claim 22, wherein the substrate is made of polydimethyl siloxane (PDMS).

38. (Original) The device of claim 22, wherein the one or more porous membranes are integral with the substrate.

39. (Original) The device of claim 22, wherein the device is a disposable device.

40. (Original) The device of claim 22, wherein the device is a reusable device.

41-54. (Cancelled)

55. (Withdrawn) The device of claim 1, wherein the porous membrane comprises pores of a pore size between 50 angstroms and 10 micrometers.

56. (Previously Presented) The device of claim 1, further comprising an upper substrate member and a lower substrate member, wherein the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member.

57. (Previously Presented) The device of claim 56, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, wherein porous membrane is located in a hollow space formed by the first and second cavities.

58. (Withdrawn) The device of claim 1, further comprising a tagged molecule in the porous membrane, wherein the tagged molecule comprises a tag that is larger than the pore size.

59. (Withdrawn) The device of claim 1, comprising a plurality of source fluid flow channels and a plurality of target fluid flow channels, wherein each pair of the plurality of source and target fluid channels has one source fluid flow channel that crosses over one target fluid flow channel at one cross-channel area.

60. (Withdrawn) The device of claim 22, wherein porous membrane comprises pores of a pore size between 50 angstroms and 10 micrometers.

61. (Previously Presented) The device of claim 22, wherein the substrate comprises an upper substrate member and a lower substrate member, wherein the source fluid flow channel is within the upper substrate member and the target fluid flow channel is within the lower substrate member.

62. (Previously Presented) The device of claim 61, wherein the upper substrate member comprises a first cavity and the lower substrate member a second cavity, wherein porous membrane is located in a hollow space formed by the first and second cavities.

63. (Withdrawn) The device of claim 22, further comprising a tagged molecule in the porous membrane, wherein the tagged molecule comprises a tag that is larger than the pore size.

64. (Previously Presented) The device of claim 22, wherein each pair of the one or more source and target fluid channels has one source fluid flow channel that crosses over one target fluid flow channel at one cross-channel area.

65. (Previously Presented) The device of claim 1, wherein the porous membrane has a property of being a passive diffusion barrier between the source fluid flow channel and the target fluid flow channel.

66. (Previously presented) The device of claim 22, wherein the porous membrane has a property of being a passive diffusion barrier between the source fluid flow channel and the target fluid flow channel.

67. (New) A microfluidic device, comprising:

a source fluid flow channel;

a target fluid flow channel, the target fluid flow channel being in fluid communication with the source fluid flow channel at a cross-channel area, wherein the source fluid flow channel crosses over the target fluid flow channel in an X fashion at the cross-channel area;

a porous membrane separating the source fluid flow channel from the target fluid flow channel in the cross-channel area, wherein the porous membrane comprises an uncoated semiconducting porous-silicon membrane; and

a field-force/gradient mechanism proximate the porous membrane, wherein the field-force/gradient mechanism comprises an electric field configured to produce a fluid movement of a fluid from the source fluid flow channel to the target fluid flow channel via the porous membrane located in the cross-channel area,

wherein the porous membrane comprises a material which is capable of exhibiting a change in both an optical and an electrical characteristic and wherein the porous membrane is a sensor exhibiting sensing characteristics causing a change in at least one of an optical and electrical characteristic in response to exposure to a targeted fluid or reaction.

68. (New) The device of claim 1, wherein the porous membrane is uncoated.

69. (New) The device of claim 22, wherein the porous membrane is uncoated.